



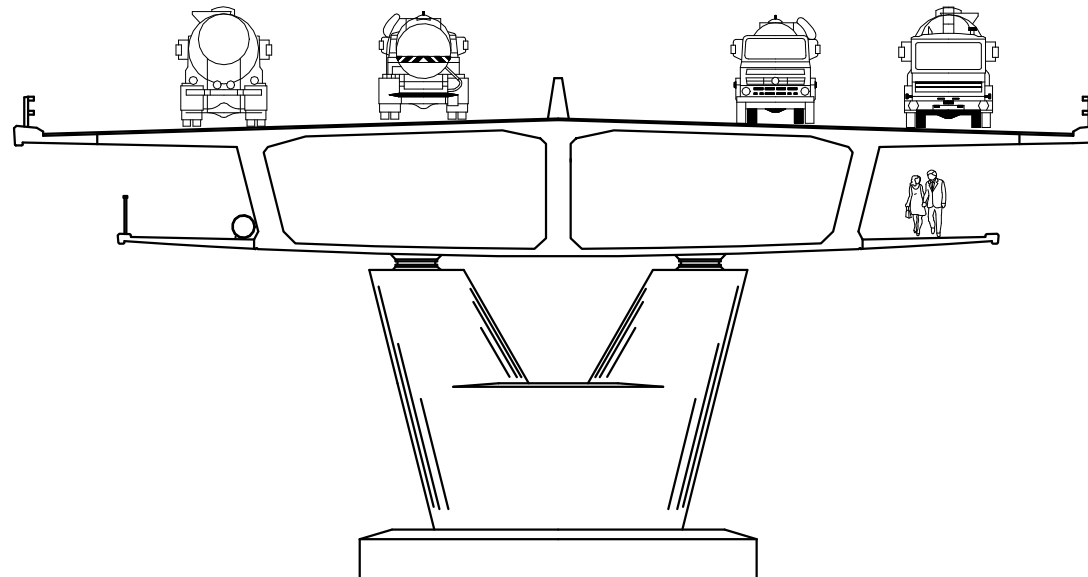
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## **Constructing the New Mt Henry Bridge, and Strengthening the Old Mt Henry Bridge**

**Talk presented by Joe Wyche, Director, Wyche Consulting  
Institution of Engineers Australia, Perth WA  
17 April 2007**



ORIGINAL BRIDGE

LAND BOUNDARY AT ABUTMENT



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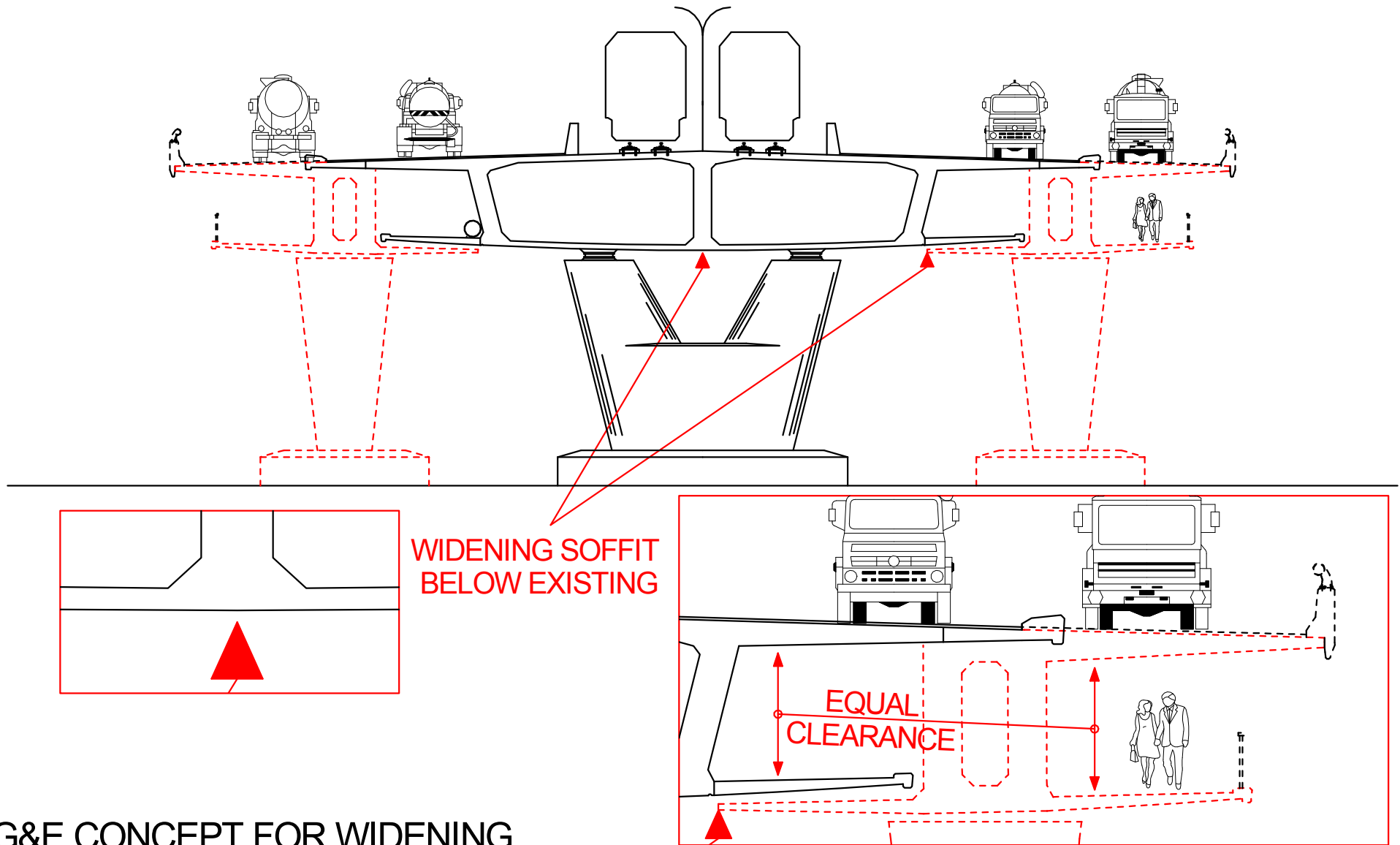
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## BG&E CONCEPT FOR WIDENING



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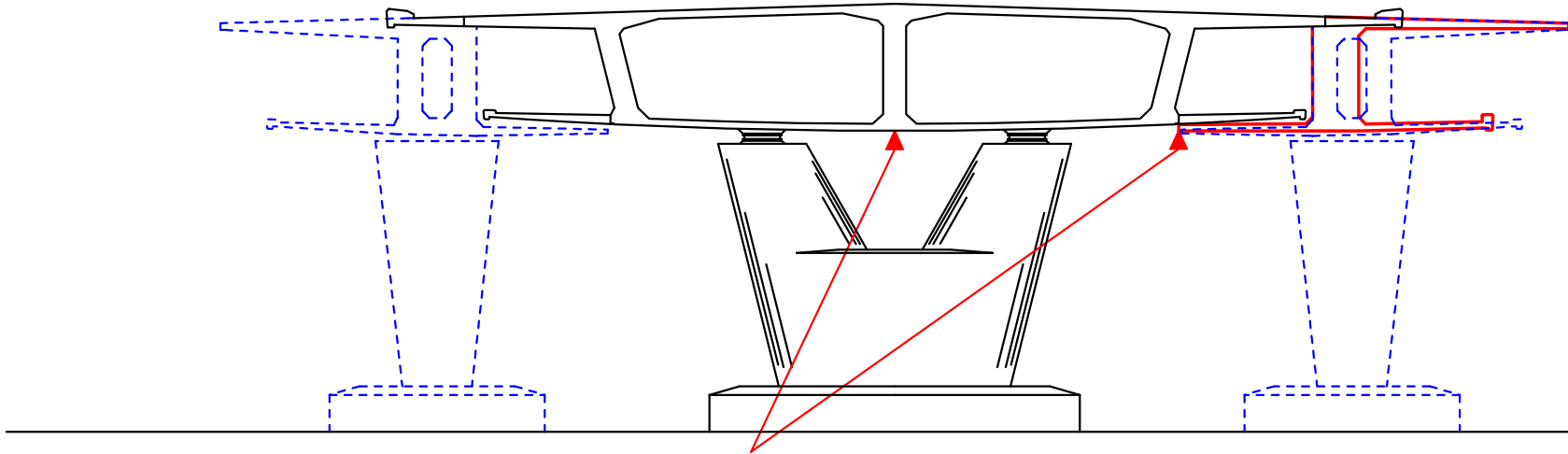
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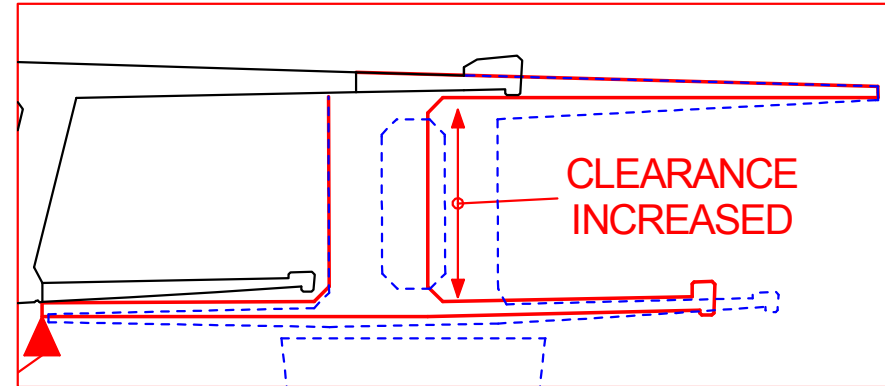
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WIDENING SOFFIT NOT  
BELOW EXISTING

- CANTILEVERS TOO THIN
- TIGHT BELOW SOFFIT



CLEARANCE  
INCREASED

## SCOPE OF WORKS CONSTRAINTS



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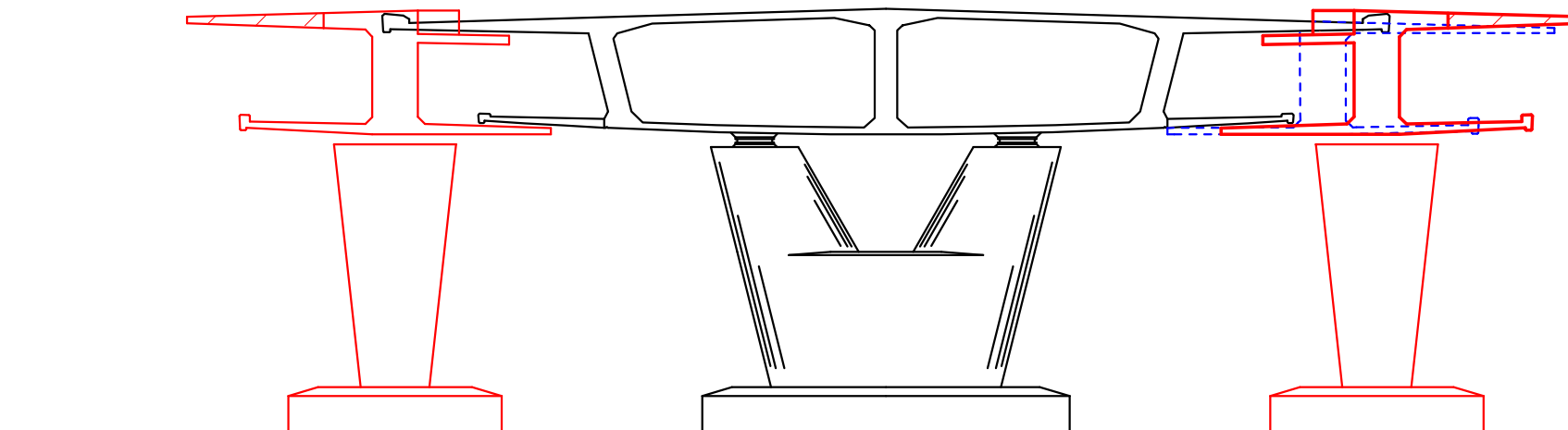
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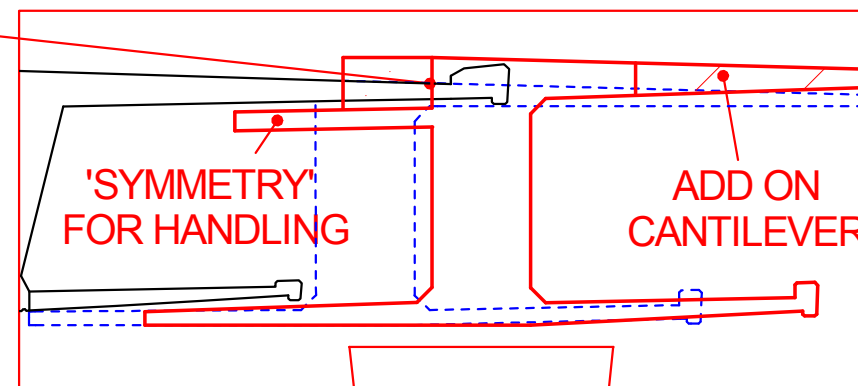
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INCREASE SECTION HEIGHT  
AND 'STITCH' INFILL

- SHIFT OUTWARDS, BETTER SOFFIT CLEARANCE
- CONSTRUCTION PROGRAM DIFFICULT



TO IMPROVE  
CANTILEVER DEPTH



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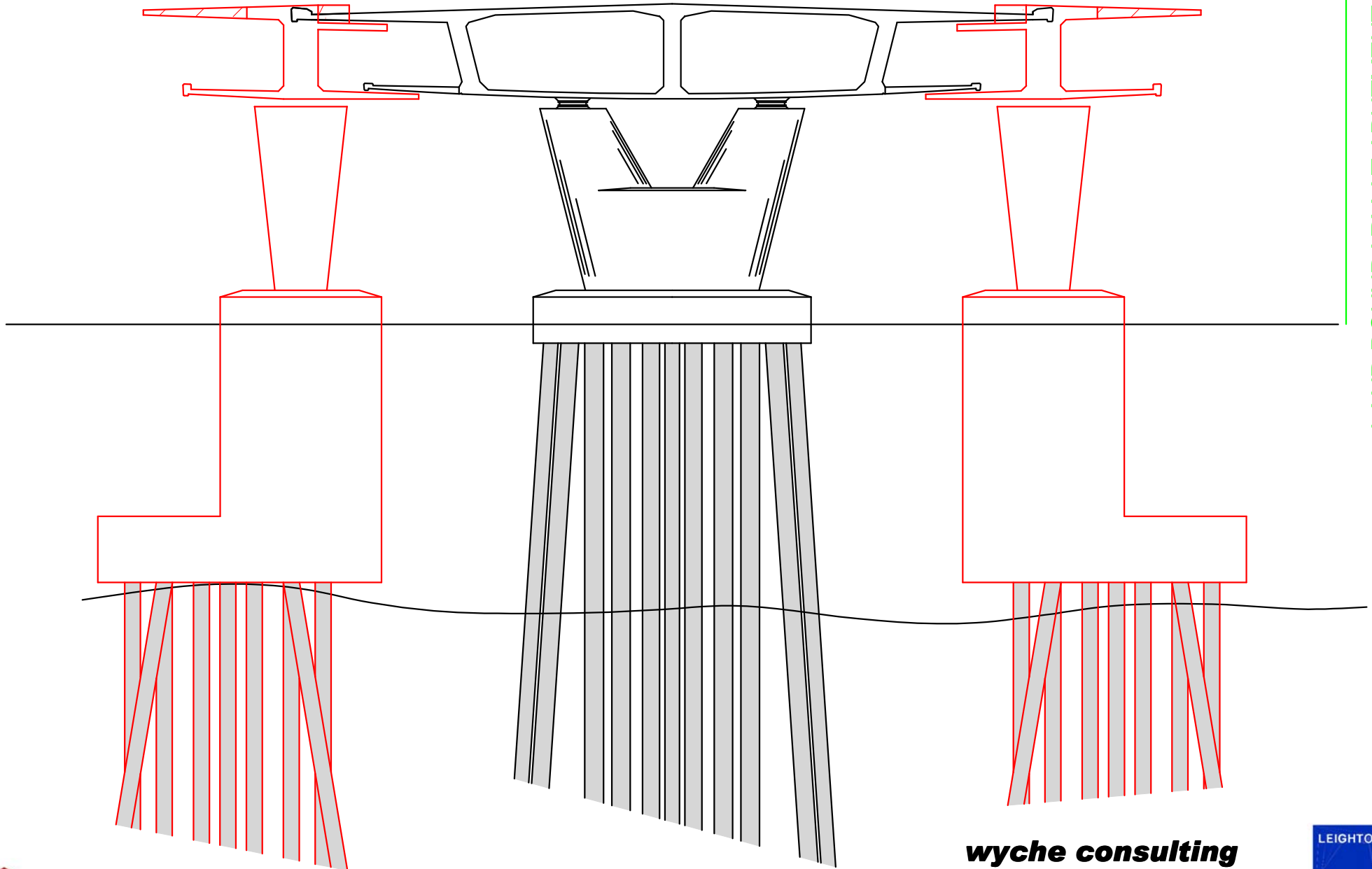
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## AN INTERESTING PILECAP



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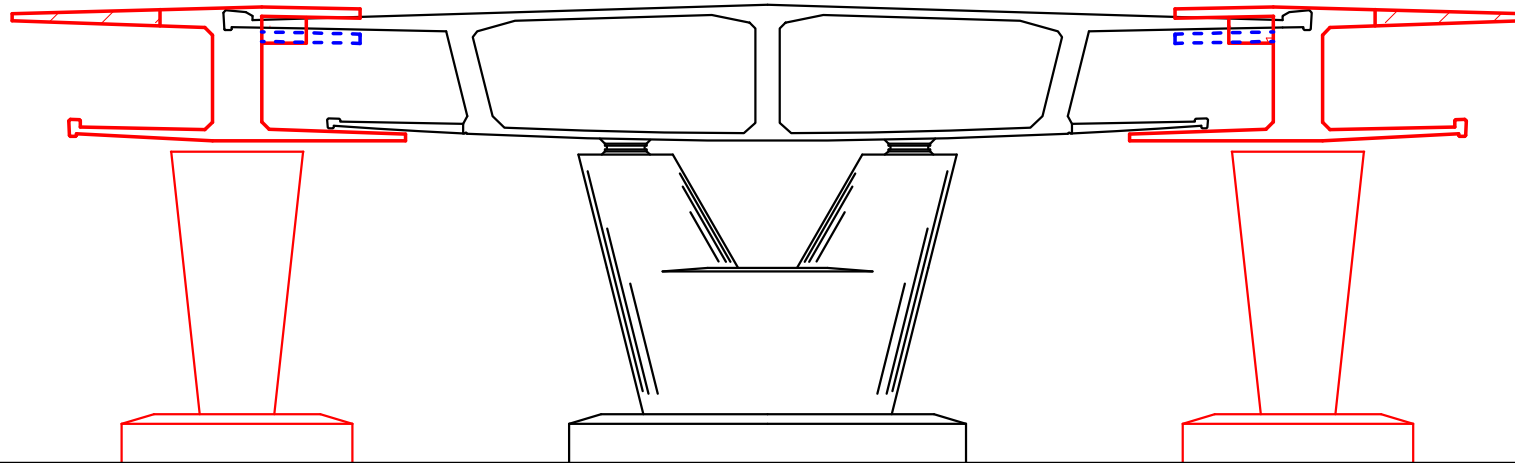
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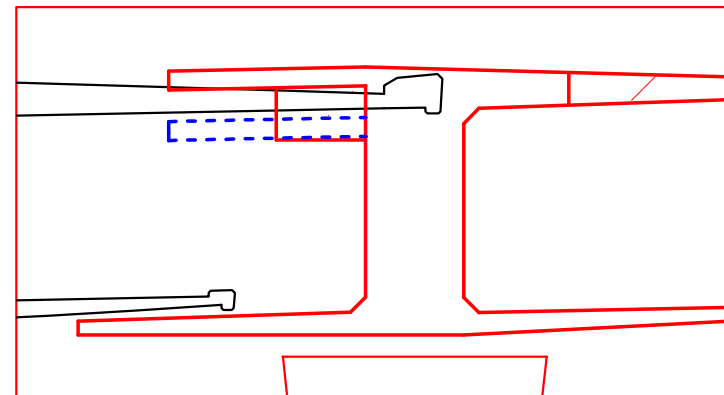


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BETTER TO PLACE  
SYMMETRY CANTILEVER  
ABOVE



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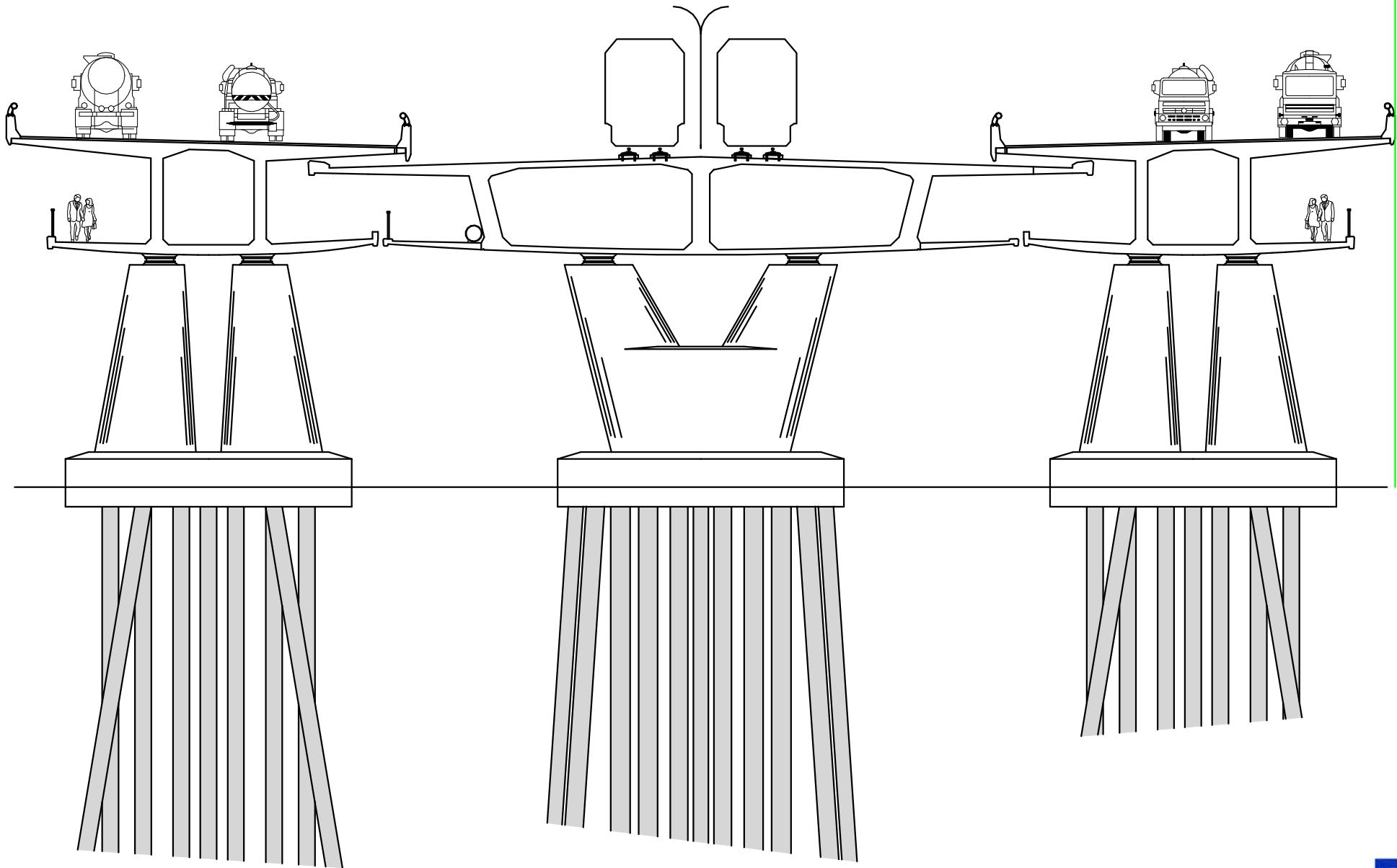
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LAND BOUNDARY AT ABUTMENT



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AN ESSENTIALLY  
CONFORMING SOLUTION

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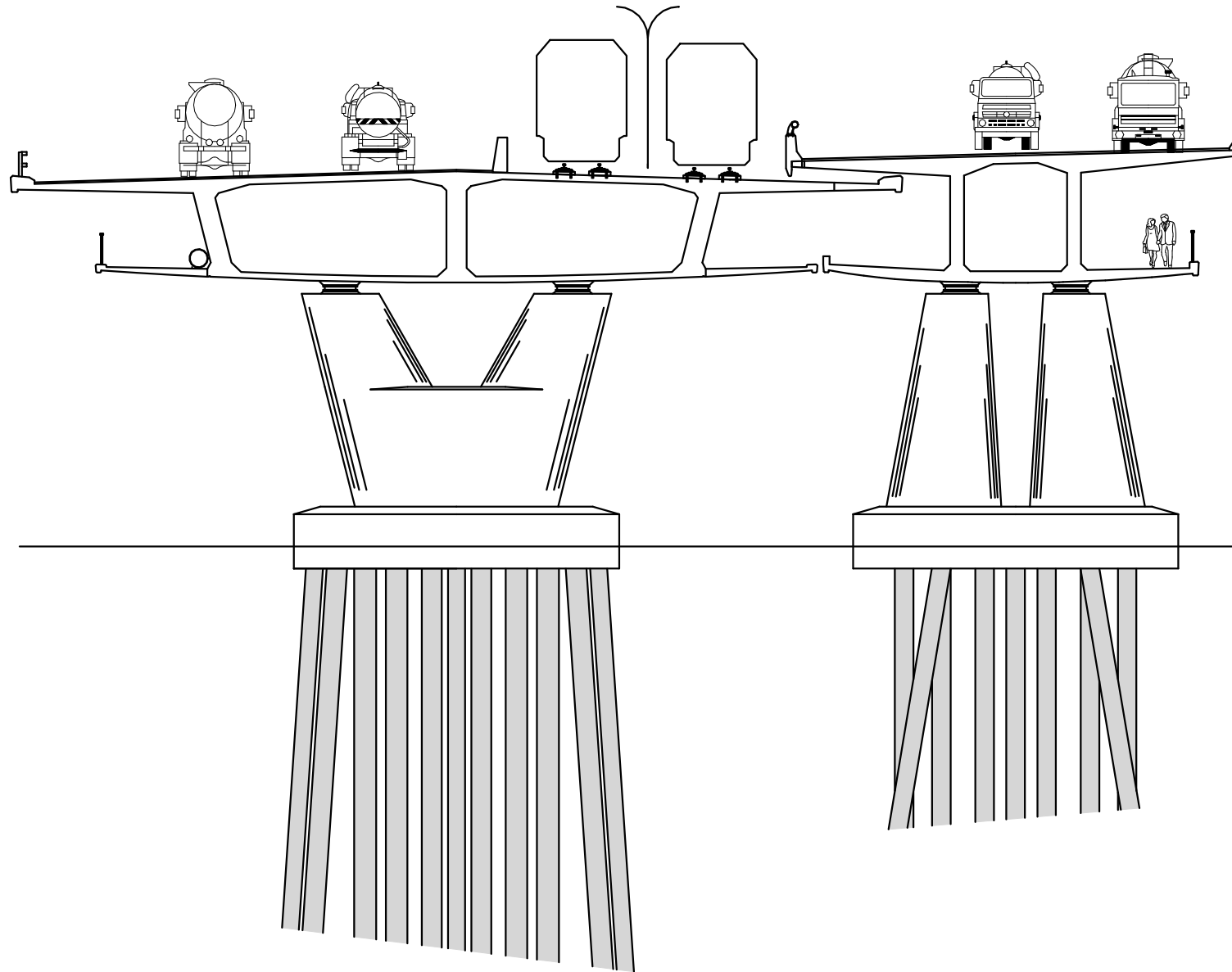
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LAND BOUNDARY AT ABUTMENT



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ALTERNATIVE  
WITH ONE BRIDGE

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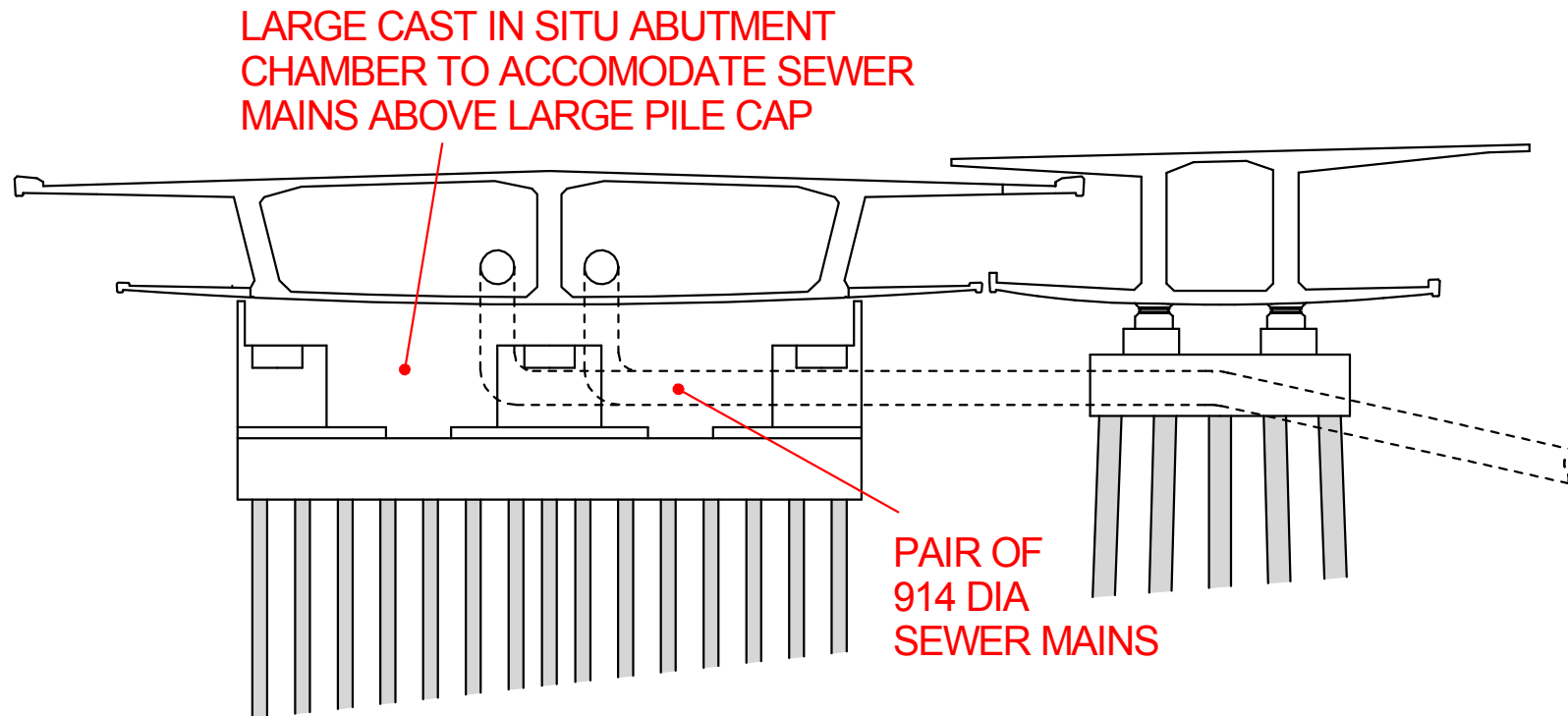
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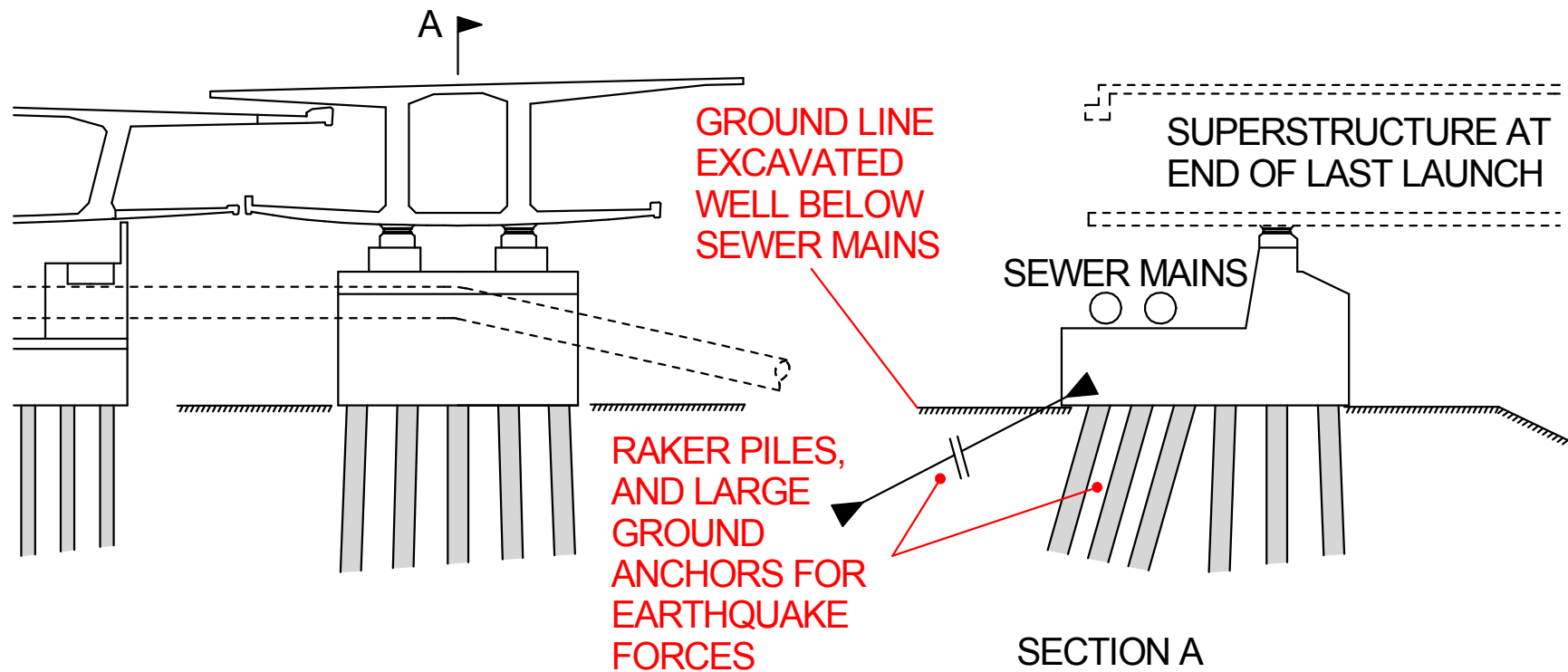


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SECTION THROUGH EXISTING AND NEW BRIDGE  
AT SOUTH ABUTMENT



DIFFICULT TO ADOPT SIMILAR ARRANGEMENT TO EXISTING BRIDGE



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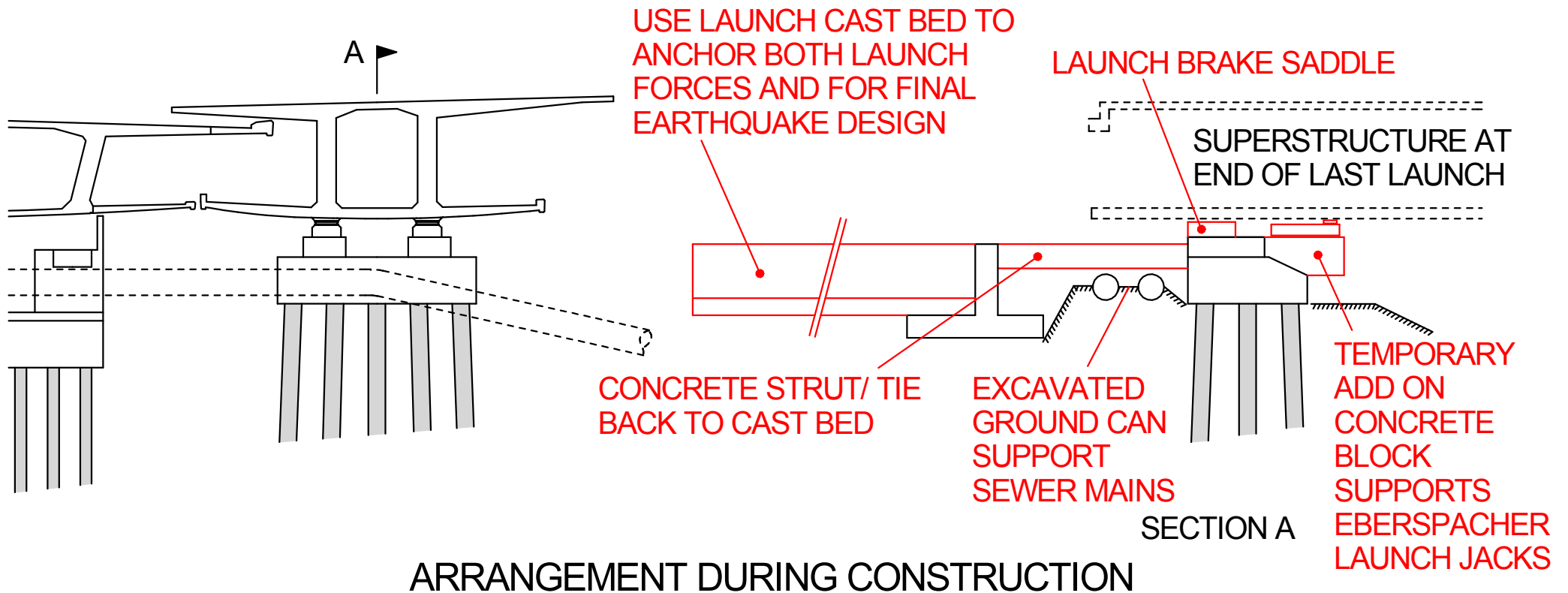
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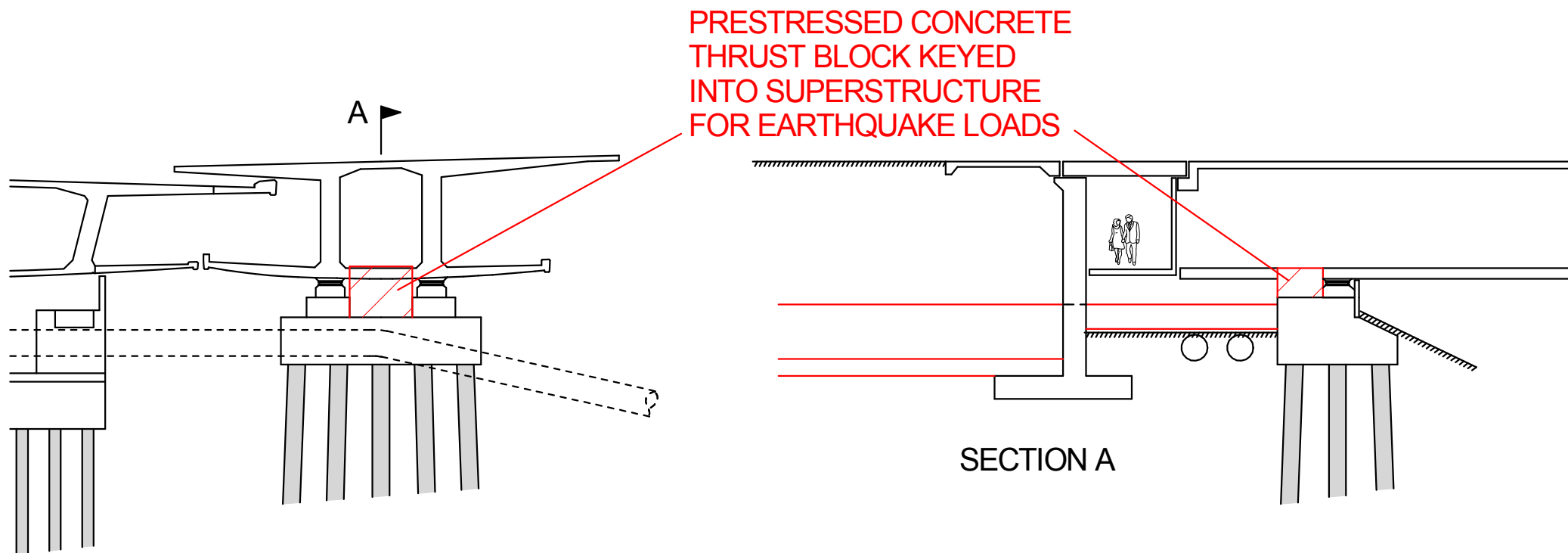
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FINAL ARRANGEMENT WITH BURIED CAST BED FOR ANCHOR



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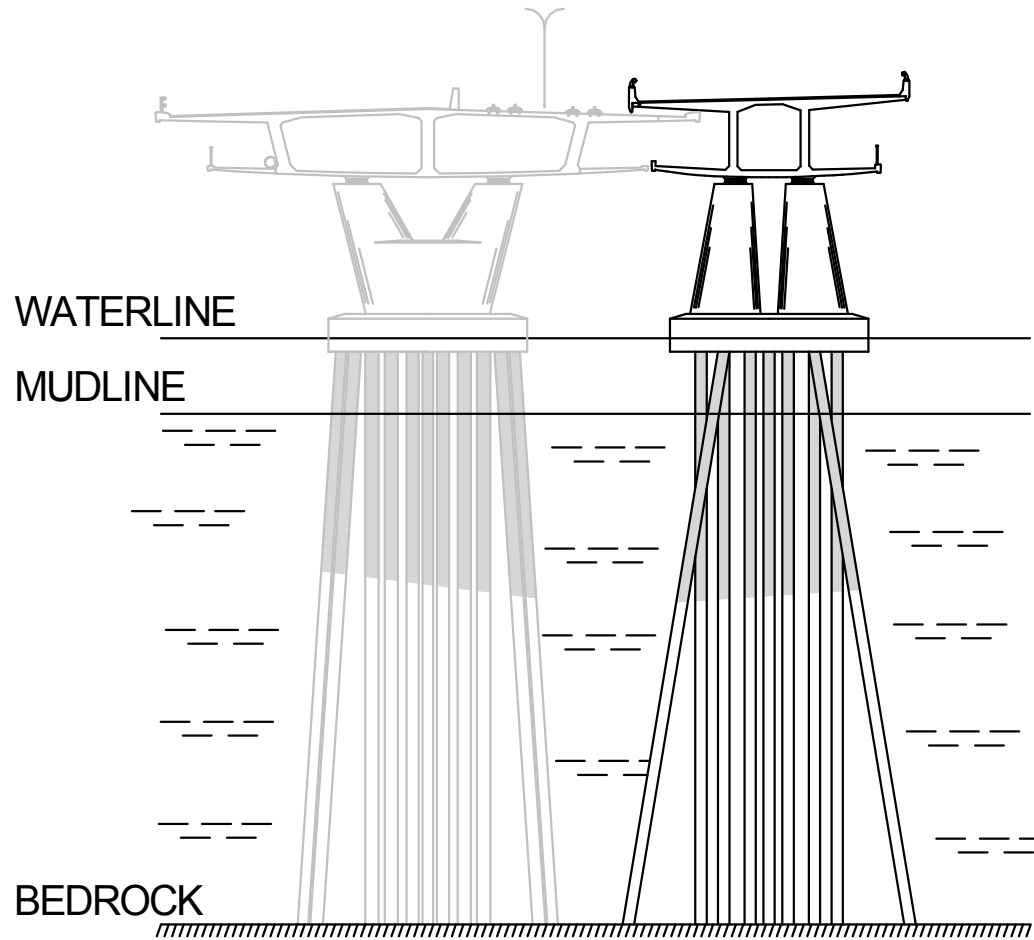
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PILES MUST BE RESTRAINED  
LATERALLY BY VERY SOFT MUD  
ABOUT 27M DEEP



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NOTE FOUR PILES ON TEMPORARY  
PIER AT HALF OF EACH 76M SPAN.  
THERE ARE AT LEAST 14 PILES ON  
PERMANENT PIERS.



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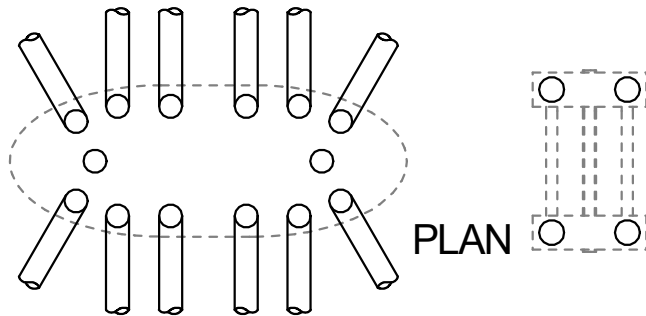
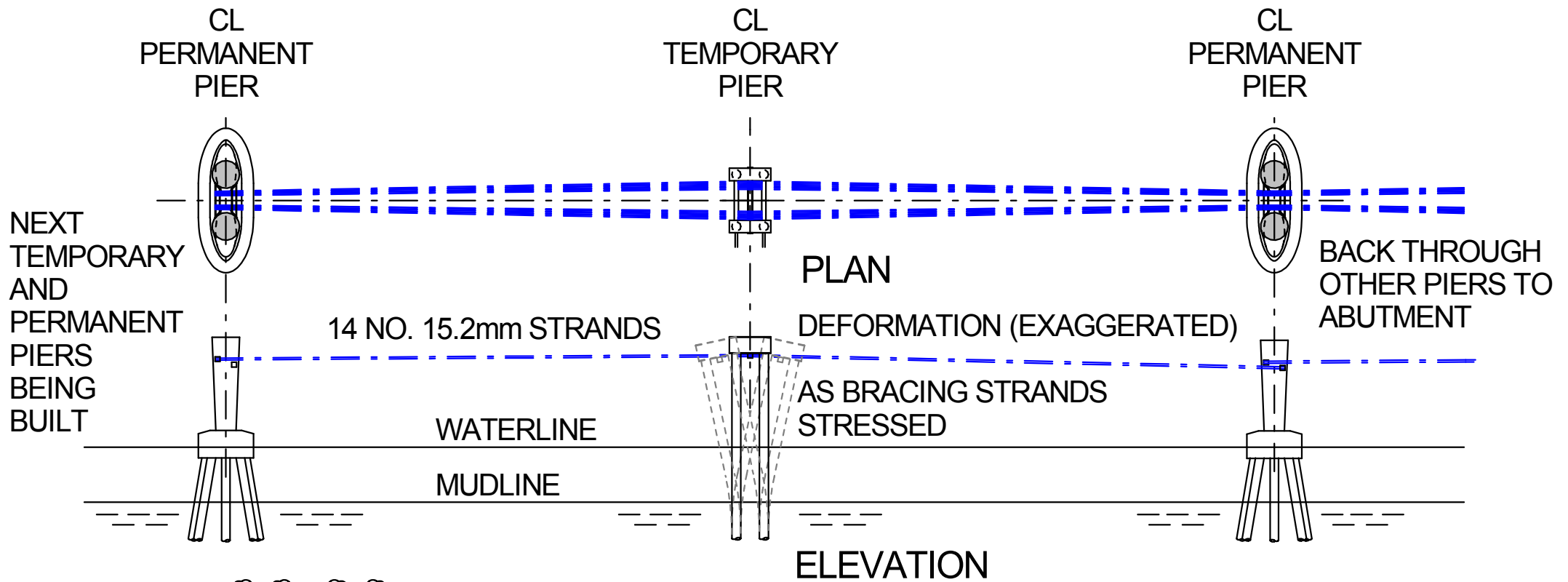
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COMPARE STIFFNESS OF 14 OR MORE  
PILES AND CONCRETE PERMANENT  
PIER TO 4 PILE TEMPORARY PIER

## HORIZONTAL LONGITUDINAL BRACING FOR TEMPORARY PIER STABILITY



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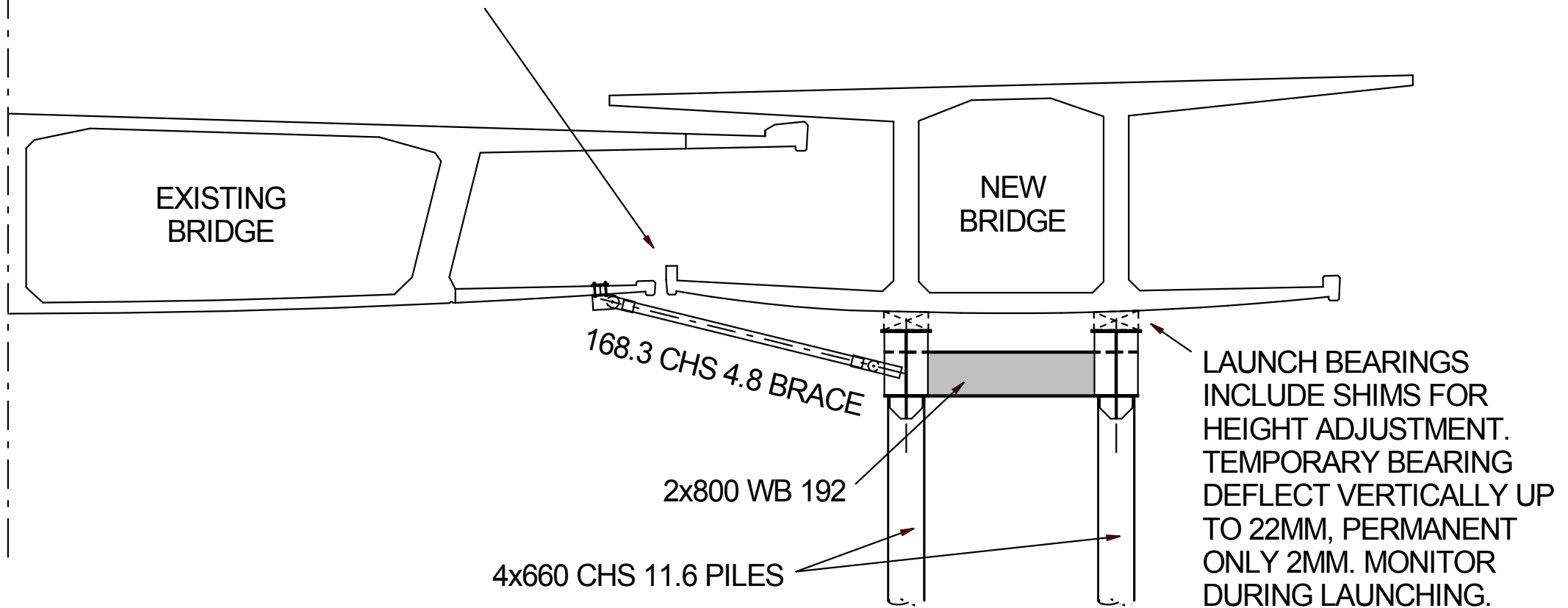
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KERB USED AS LATERAL SIDE GUIDE  
FOR ROLLER SUPPORT ATTACHED TO  
EXISTING BRIDGE



## SOME FEATURES OF TEMPORARY PIER AND LAUNCHING CONTROL



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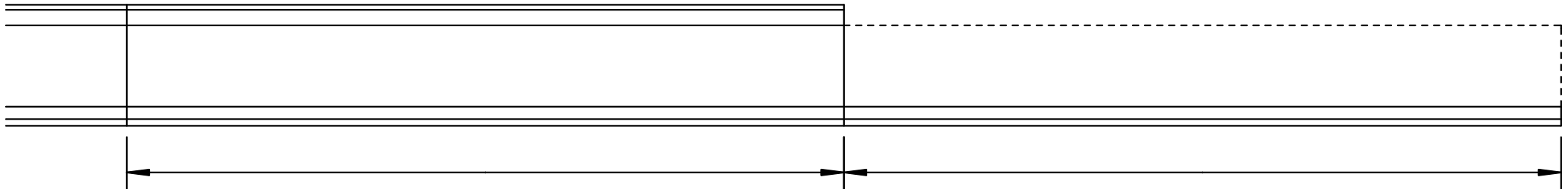
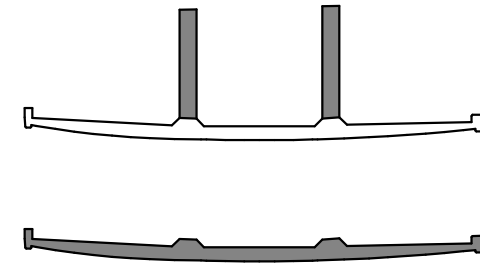
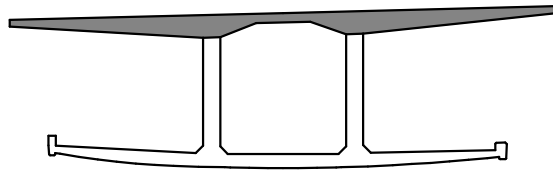




ROLLER SIDE GUIDE HOOKED OVER  
LOWER FLANGE KERB



TEMPORARY PIER AND BRACING



FRONT CAST BED WITH SPECIAL SCAFFOLDING  
TO LOWER CANTILEVER FORMS. TOP DECK CAST  
IN SAME CYCLE AS REAR LOWER FLANGE AND  
WEBS

REAR CAST BED FOR LOWER FLANGE ON  
ARCHITECTURAL FORMS, THEN WEB. FORMS  
LOWERED ON TRANSVERSE BEAM GRILLAGE.

7 TO 10 DAY LAUNCH CYCLE



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Top 3 photos

1. CAST BED WITH SUPPORT GRILLAGE IN REAR
2. LOWER FLANGE 1ST SEGMENT
3. AFTER FIRST LAUNCH

Lower 2 photos

4. PREPARE REAR LOWER AND FRONT UPPER CAST.
5. LIFTING IN REAR RF CAGE.



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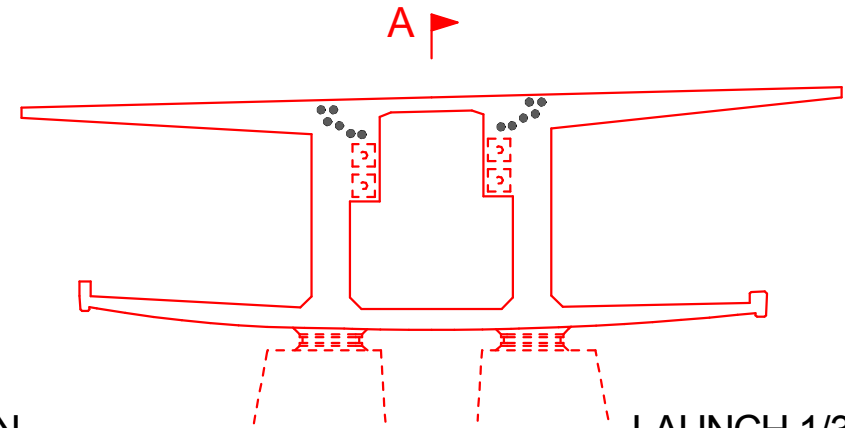
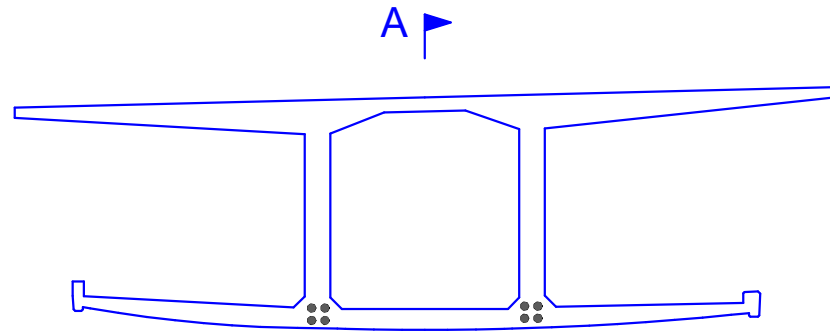
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LAUNCH 1/3 RD SPAN

LAUNCH 1/3 RD SPAN

LAUNCH 1/3 RD SPAN

SECTIONAL ELEVATION A

PLAN ON WEBS



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LOOKING ALONG THE BRIDGE  
INSIDE THE BOX GIRDER



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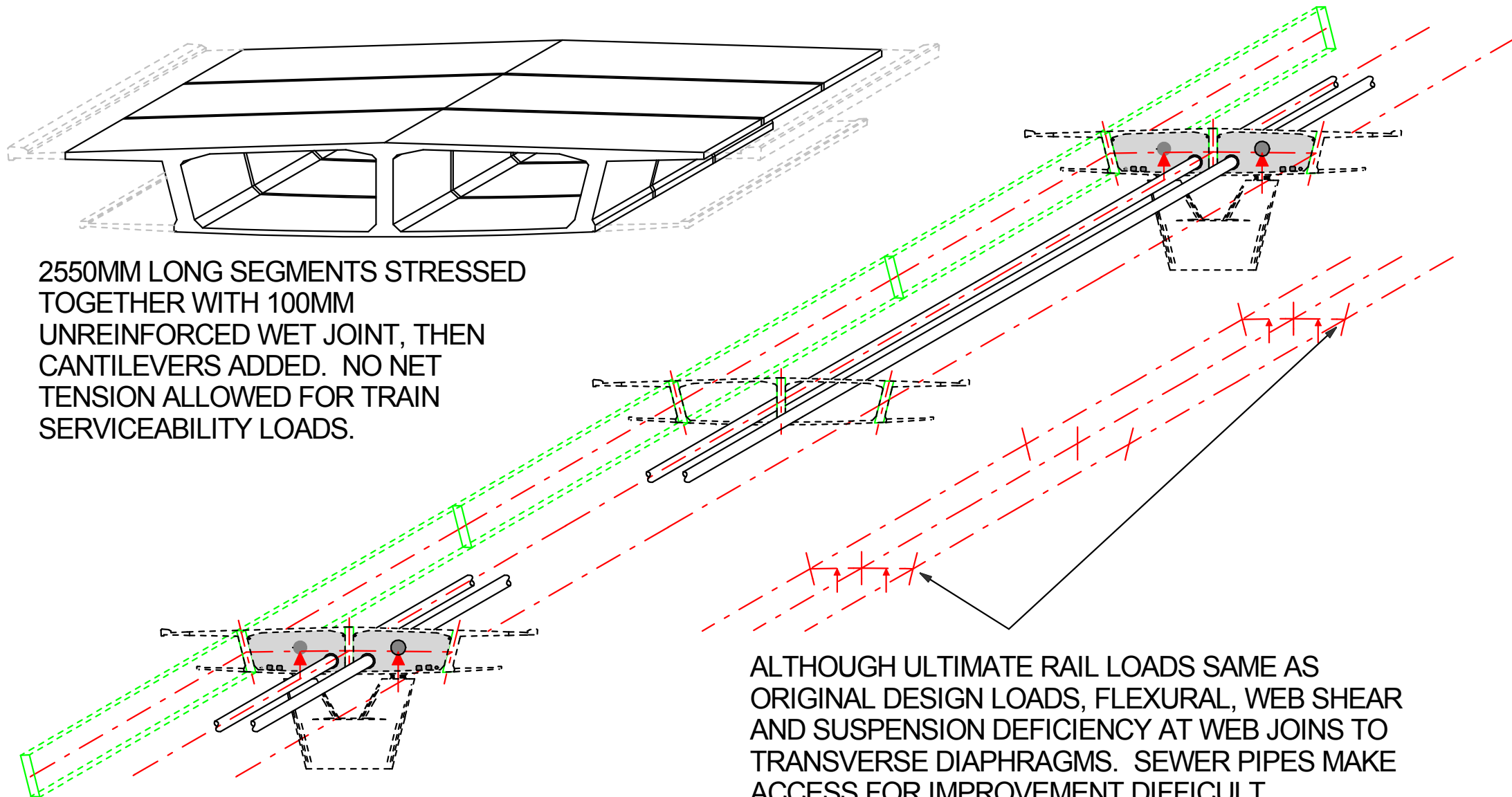
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## IMPROVEMENTS NEEDED FOR EXISTING BRIDGE



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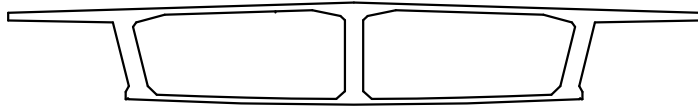
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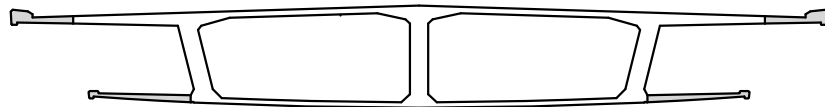


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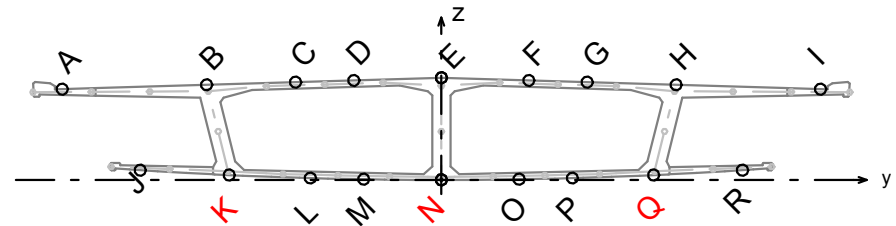
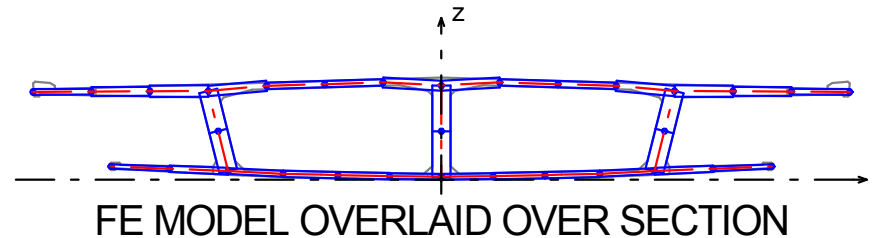
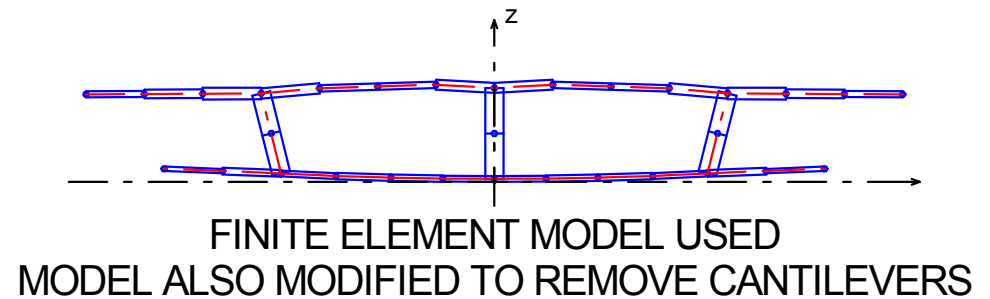


BRIDGE ANALYSED FOR SPAN BY SPAN CONSTRUCTION STAGING EFFECTS, UP UNTIL CANTILEVERS ADDED. THE ADDITION OF PRESTRESS BEFORE ADDING THE CANTILEVERS IS VERY BENEFICIAL IN PROVIDING SERVICEABILITY COMPRESSIVE STRESS.



COMPLETED BRIDGE ANALYSED FOR SUBSEQUENT CREEP AND SHRINKAGE, SUPER DEAD LOAD AND IN SERVICE LOADS.

FINITE ELEMENT ANALYSIS TO DIRECTLY CALCULATE IN SERVICE STRESSES



STRESS CHECK POINTS TENSILE STRESSES IN SERVICE AT **K**, **N**, **Q** OF OVER 2MPa IN SPAN 1, AND GENERALLY MUCH LESS THAN 1MPa IN OTHER SPANS. NOTE THAT WEB END STRESSES PROJECTED FROM WEB ELEMENT STRESSES, AND RECONCILED TO TOTAL MOMENT.







## EXTERNAL PRESTRESS FLOOR BLISTER



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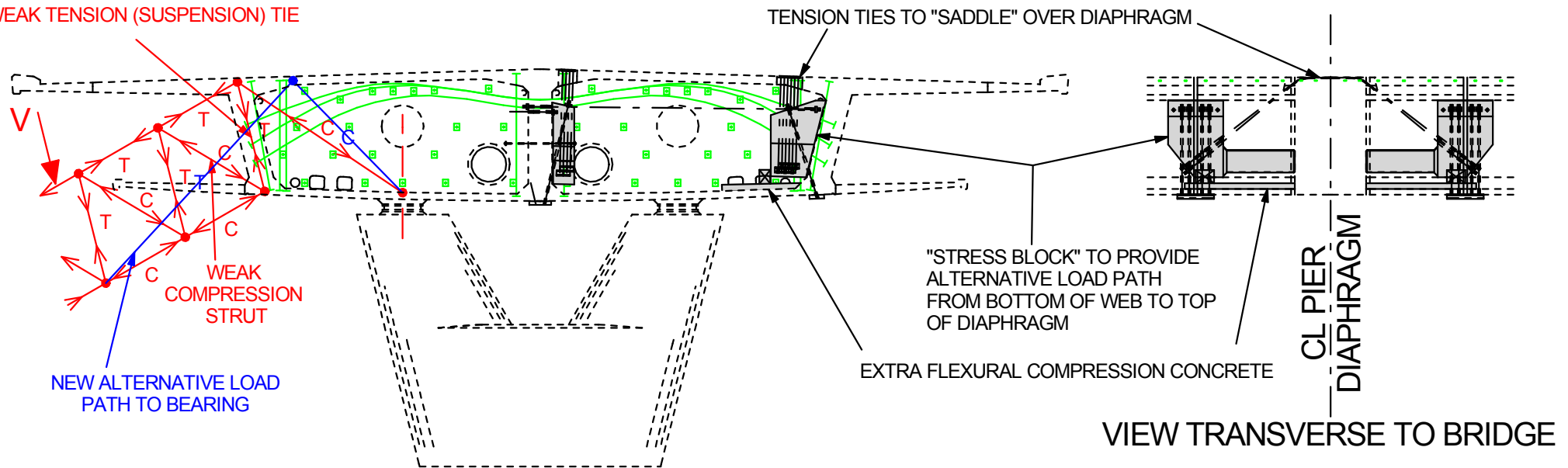
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WEAK TENSION (SUSPENSION) TIE



VIEW ALONG THE BRIDGE



SADDLE - 95 WIDE X 45 THICK,  
WITH THREADED SOCKETS  
BUTT WELDED TO ENDS FOR  
40MM STRESS BARS.

#### DESIGN/ CONSTRUCTION PROBLEMS

1. ANALYSIS 3D SPACE FRAME MODEL. SEE [WYCHE.COM.AU](http://WYCHE.COM.AU).
2. LOCATE AND AVOID PS AND RF IN WEBS WHEN CORING FOR STRESS BARS.
3. MUST PRESTRESS STRESS BARS TO PROVIDE STIFFNESS COMPATIBILITY.
4. FITTING INTERFACE SHEAR STEEL FOR FLEXURAL COMPRESSION CONCRETE INTO BOTTOM OF WEB.

## FLEXURE/ SHEAR/ SUSPENSION STRENGTHENING



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EXTRA FLEXURAL  
CONCRETE



STRESS BLOCK  
REINFORCEMENT



STRESS BARS  
TO SADDLES



FINISHING BELOW  
SADDLES



SADDLES UP ON DECK  
BEFORE COVERING



CONCRETE STRESS BLOCK  
OUTER WEB



CONCRETE STRESS BLOCK  
INNER WEB BEHIND SEWER PIPE

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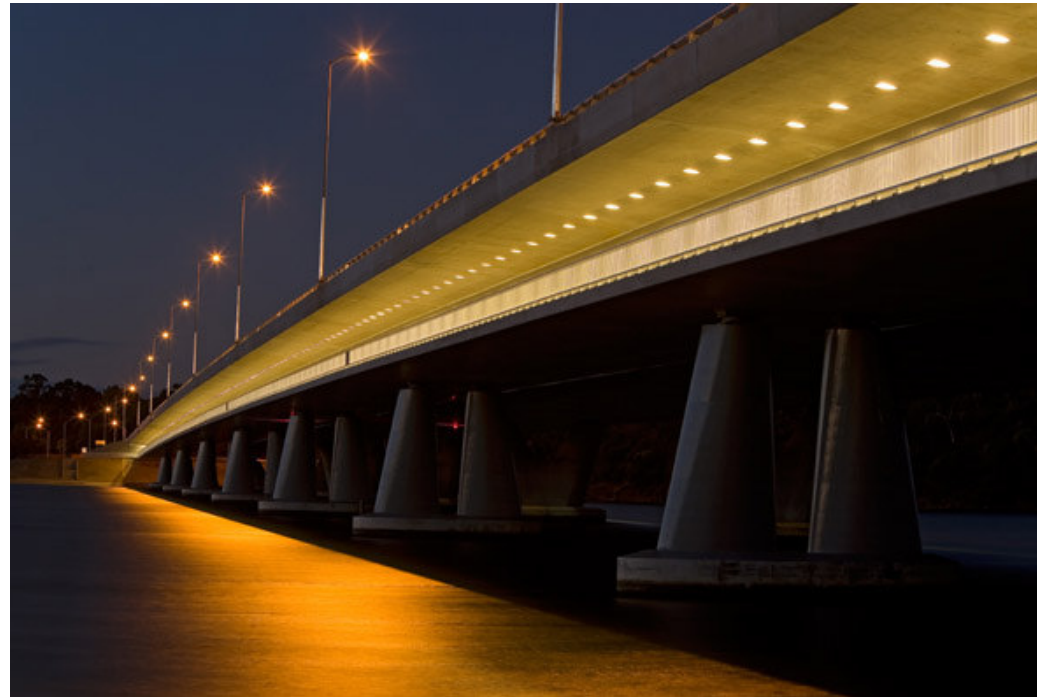
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**Constructing the New Mt Henry Bridge, and  
Strengthening the Old Mt Henry Bridge**

**THANK YOU FOR ATTENDING**

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